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## **A survey of sports drinks consumption amongst adolescents**

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## **Abstract**

**Background:** Sports drinks intended to improve performance and hydrate athletes taking part in endurance sport are being marketed to children, for whom these products are not intended. Popularity amongst children has grown exponentially, worryingly they consume them socially, as well as during physical activity. Sports drinks are high in sugar and are acidic. Product marketing ignores the potential harmful effects of dental caries and erosion.

**Objective:** To investigate the use of sports drinks by children.

**Method:** 183 self-complete questionnaires were distributed to four schools in South Wales. Children in high school years 8 and 9 (aged 12 - 14) were recruited to take part. Questions focussed on use of sports drinks, type consumed, frequency of and reason for consumption and where drinks were purchased.

**Results:** 160 children responded (87% response rate). 89.4% (143) claimed to drink sports drinks, half drinking them at least twice a week. Lucozade Sport™ was the most popular brand. The main reason for consuming the drinks was attributed to the “nice taste” (90%, 129/143). Most respondents purchased the drinks from local shops (80.4%, 115) or supermarkets (54.5%, 78). More boys claimed to drink sports drinks during physical activity (77.9% versus 48.6% girls,  $p < 0.001$ ). Whereas more girls claimed to drink them socially (51.4% versus 48.5% boys, NS).

**Conclusion:** A high proportion of children consumed sports drinks regularly and outside of sporting activity. Dental health professionals should be aware of the popularity of sports drinks with children when giving health education advice or designing health promotion initiatives.

## INTRODUCTION

Sports drinks have become more popular over recent years with the younger generation<sup>1,2</sup>. In the 1970s, marathon runners were discouraged from drinking any fluids as it was thought it would slow the runners down. But, now runners are being encouraged to “drink ahead of thirst”<sup>3</sup> with the recognition that hydration is associated with performance. Sports drinks are designed to improve performance and hydrate elite adult athletes taking part in endurance and intense sporting events<sup>4</sup>. There is no evidence of beneficial effects in non-elite athletes or children<sup>3</sup>. However, these drinks are being consumed by the general population during physical activity and socially. It is the latter which is the most cause for concern<sup>5</sup>, particularly amongst children aged under 16<sup>3</sup>.

The marketing of sports products has become a multibillion-dollar industry<sup>6</sup>. In 2014, the UK sports drinks market was worth £218 million and the core consumers were 15-24 year olds<sup>1</sup>. However, the marketing campaigns ignore the detrimental impact sports drinks have on teeth and the effects they can have on general health. Certain marketing campaigns have even misled consumers into incorrectly concluding that the drinks contained no carbohydrates or additives<sup>6</sup>. In addition, studies have shown that while certain supplements in sports drinks can potentially improve performance, many have not been proven to be beneficial and some have harmful side-effects<sup>6</sup>.

If consumed socially and in large quantities, sports drinks can lead to serious problems, such as obesity, diabetes, heart disease and gout<sup>7</sup>, as well as poor oral health<sup>4</sup>. Studies in the past have shown that non-athletes are consuming these drinks simply because of their nice taste<sup>2</sup>.

Sports drinks contain both free sugars and acids<sup>4</sup>, hence these drinks have the ability to cause both dental caries and erosion. There is a strong relationship between eating foods high in “free” sugars and dental caries<sup>8-11</sup>. The term free sugars refers to all mono and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, fruit juices and syrups<sup>12</sup>. Many sports drinks have a pH below 5.5, the critical pH for the demineralisation of enamel, leading to erosion<sup>13,14</sup>. Dehydration associated with physical activity increases erosion risk, as the buffering capacity is inhibited due to lower salivary flow<sup>4</sup>. Dehydration also reduces clearance of acids and sugars from the tooth surface, affecting both erosion and caries<sup>4</sup>.

The frequency and duration of sports drinks consumption are also important factors impacting on dental health<sup>15</sup>. The general consensus is that the frequency and amount of sugary food and drinks should be reduced and, when consumed, limited to mealtimes<sup>16</sup>. Certain sports drinks, e.g. Powerade zero™, are marketed as being sugar free. However, these drinks still have an acid content that can lead to erosion of enamel<sup>13,14</sup>.

A study conducted in the dental clinic at the Olympic Park during the London 2012 Olympics assessed the general oral hygiene of 278 participating athletes<sup>17</sup>. The authors reported that 55% of the athletes treated had dental caries and 45% had dental erosion (as measured by the Basic Erosive Wear Examination). This is a much higher prevalence than the experience of “tooth wear” recorded by the UK Adult Dental Health Survey in 2009<sup>18</sup> for similarly aged adults. Whilst the Olympic athletes came from the five continents<sup>17</sup> the authors reported no significant difference in erosion by continental location or ethnicity. They also reported a link between the frequency of sports drinks use and dental erosion in anterior teeth<sup>17</sup>.

Recent surveys have shown that Wales has higher levels of decayed, missing and filled teeth (DMFT/dmft) when compared with other areas in the UK, especially in children. In 2013, 52% of children aged 12 in Wales had at least one DMFT in their adult teeth compared with 32% in England<sup>19</sup>. Of concern are the wide inequalities in experience, with children from more deprived areas experiencing higher levels of dental disease<sup>19, 20</sup>.

There is confusion over the difference between energy and sports drinks. An energy drink is marketed for its mental stimulant effect and contains high levels of substances such as caffeine, taurine and glucoronolactone<sup>21</sup>. Sports drinks do not have a stimulant effect, but concentrate on providing carbohydrates, salts and hydration<sup>1,22</sup>. For the purpose of this study, the participants were not told what constitutes a sports or energy drink, as their knowledge of sports drinks was also being tested.

According to Mintel (2014), 78% of UK 16-24 year olds have reported consuming a sports drink in the last 12 months, with 39% drinking them at least once per week<sup>1</sup>. From 1989–2008, the percentage of American children aged 6 to 11 consuming sports drinks increased significantly, from 2% to 12%. The amount of sports drinks consumed by these American children also increased, from 255 millilitres per day to 289 millilitres per day during the same timeframe<sup>2</sup>.

All school meal policies in the devolved countries of the UK have banned the sale of fizzy/sugary drinks other than fruit juices diluted with carbonated water<sup>23-26</sup>. Therefore students are accessing sports drinks from outside the school gates.

Few studies have investigated the use of sports drinks in children, their knowledge about the product and the impact they may have on their oral health. The aim of this study was to investigate the use of and knowledge surrounding sports drinks by 12-14 year old school children in South Wales, UK. This paper reports on consumption aspects only; the knowledge component is reported separately.

## METHOD

This study consisted of a questionnaire survey of 12-14 year old school children recruited from a convenience sample of four secondary schools in South Wales. Schools were selected to reflect the range of deprivation experienced within the area (according to the Welsh Index of Multiple Deprivation, WIMD 2011<sup>27</sup>). School A was a private school; School B a comprehensive school, whose catchment area draws from the most deprived areas in Wales; Schools C and D were also comprehensive schools, but their catchment area drew from a more mixed demographic<sup>27</sup>. Furthermore schools C and D provided male and female education one separate sites.

Prior to the commencement of this study ethical approval was gained from the Dental School Ethical Committee at Cardiff University.

A focus group of eight adolescents (aged 12 – 16) was undertaken to inform the questionnaire design. Participants were informally asked whether they drank sports drinks and why?

With information gained from the focus group, a self-complete anonymous questionnaire was designed containing mainly closed questions, allowing categories to be analysed efficiently and with minimum bias<sup>28</sup>.

Questions reported in this paper were designed to assess:

1. whether respondents consume sports drinks and if so how often and what types?
2. where and when respondents purchase and consume sports drinks?
3. why respondents consume sports drinks?

Children from school years 8 (12-13 years old) and 9 (13-14 years old) were invited to take part in the study from each of the selected schools. Headmasters from each school were asked to nominate one class per school year to take part. A combination of school consent, parental negative consent and child assent was used in this study. Respondents were told that participation was voluntary before they completed the questionnaire. One researcher (DB) was present at each school to distribute and collect the questionnaires and also to answer any questions about the project.

The data were analysed using appropriate descriptive and inferential statistics, such as frequency distributions and chi-squared test for categorical variations (with an alpha value of 0.05 accepted as significant). Statistical analysis was performed with IBM SPSS Statistics (Version 20) software.

## RESULTS

Demographic details of the schools and the number of participants from each school and year are presented in Table 1. 183 questionnaires were distributed amongst the four schools. In total, 160 respondents completed the survey (87% response rate); one Year 8 class from school A was unable to take part because of the timing for exams coinciding with data collection. The majority, 89.4% (143/160), of respondents claimed to drink sports drinks. The analyses below relate to the responses from those (n=143) who claimed to drink sports drinks.

### *Consumption of sports drinks, frequency and type*

Almost half of these respondents drank them more than once a week (48.3%, 69); 14% (20) drinking one or more every day. The modal consumption frequency was 2-3 times a week (Figure 1).

Respondents were asked to indicate which of the four bestselling UK sports drinks (Lucozade Sport™, Powerade™, Gatorade™, LSV®) they consumed and an “other” category was also provided. The most popular drink was Lucozade Sport™ (88.8%, 127) whilst Gatorade™ was the least popular (9.8%, 14, Figure 2).

All but one response to the “Other” category were “energy” drinks, not marketed as “sports” drinks. These energy drinks were Relentless®, Monster®, Red Bull®, Power-up™, Original Energy Drink, Rockstar Energy drink™, Emerge, No Fear™ and Boost energy drink. The only “other” sports drink was an unbranded isotonic drink.

### *Location of purchase*

The purchase locations for the sports drinks are presented in Figure 3; there were 242 locations mentioned by 143 respondents who reported drinking them, allowing multiple purchase location responses.



Most of the sports drinks were being purchased in local shops, with 115 (80.4% of respondents). Supermarkets were also popular with 78 mentions, which equated to 54.5% of respondents. The four mentions of “Other” were; bakery, Home Bargains, Spar and Lidl.

### *Context of consumption*

Respondents were asked in which situation they drank sports drinks limited to 5 categories which were isolated during the focus group discussion (Figure 4).

There was a clear gender difference, far more boys than girls consumed sports drinks during physical activity and at meal times (Figure 4). One respondent failed to state their gender on the questionnaire resulting in  $n=142$  for this analysis. The majority of boys (77.9%, 53 respondents out of 68) reported drinking these products during physical activity compared with only 48.6% (36 respondents out of 74) of girls ( $p<0.001$ ). However, more girls drank sports drinks at home (41.9% of girls compared with 32.4% of boys) and socially (51.4% of girls compared to 48.5% of boys); neither of these results were statistically significant ( $p>0.05$ ). These results reflect responses to respondent's participation in sport. 86.8% (59/68) of male respondents participated in sport compared with 71.6% (53/74) of female respondents.

### *Reasons for consuming sports drinks*

The most popular reason for consuming sports drinks was the taste of the product (90.2% 129/143). Energy and hydration were reasons given by 47.6% (68/143) and 23.1% (33/143) of respondents respectively. The fact that sports drinks enhance performance was only stated by 18.2% (26/143) as a reason for consumption (Figure 5).

Approximately one third (32.9%, 47/143) of respondents stated price as a reason for purchasing sports drinks (Figure 5). When questioned how much they would spend, the majority would spend between 50p and £1 for a sports drink (55.9% of respondents). 38.5% would pay over £1 for a sports drink.

## **DISCUSSION**

The results obtained clearly show a high proportion of adolescents in South Wales are consuming sports drinks.

The reported prevalence of sports drinks consumption for 12-14 year olds participating in this study was high at 89%, with 68% of these children drinking them regularly (1-7 times a week). Both the prevalence and the frequency of consumption in this age group appear to have increased in recent years<sup>29, 30</sup>.

In the late 1990s a study of 418 14 year old secondary school children in Birmingham, recorded a prevalence of 44%, with 77% of these consuming sports drinks 1-7 times per week<sup>29</sup>. Whilst a larger UK study in the North West of England, of 2,385 14 year old children in 1999, reported 81% drinking sports drinks occasionally or regularly<sup>30</sup>.

Mintel market analysis data (52 weeks ending 1 March 2014) indicated that Lucozade™ represents 63% of the sports drink market, followed by Powerade™ taking 14% and own label and others taking 23%<sup>1</sup>. This was reflected by the younger population of this study where Lucozade™ and Powerade™ predominated. However just under half of the sample reported drinking LSV® which was not separately identified by the Mintel data - this may be a reflection of the fact that LSV® is labelled as an Energy Drink but marketed as

“a functional beverage, specially developed for periods of increased mental and physical exertion”<sup>31</sup>.

When questioned why they drink sports drinks, 90% claimed the taste was a factor where only 18% of the respondents claimed it was due to the performance enhancing effect. This mirrors findings of the US Healthy Eating Research Review in 2012<sup>2</sup> and Food Standards Australia New Zealand in 2010<sup>32</sup>, which found people were consuming these drinks simply because they tasted nice. Taste of these sports drinks was the primary factor given by this group of 12-14 year olds and appears to be the main reason why they appeal to younger consumers. Improvements in physical performance was given as a reason for drinking by a minority of participants, even though over 71.6% of girls and 86.8% of boys in this study claimed to be taking part in exercise.

The results also showed that about a half of the respondents who drink sports drinks claim to drink them socially. This is likely to be linked to the fact that consumer independence is well developed and also the fact that the influence of peers (whilst socialising) is particularly strong

for this age-group<sup>33</sup>. This has implications for dental and wider public health, in terms of dental caries, dental erosion and obesity.

Most of the children (80%) purchased sports drinks in local shops, once again highlighting the influence of stores surrounding the school fringe in the availability of “less healthy” foods and beverages, including sports drinks – often available at value prices<sup>34,35</sup>. Indeed, price itself was the third most recorded reason for purchase. Of concern, 26% and 6% of children cited leisure centres and schools as purchase sources. In the UK in recent years holistic food and health policies<sup>35,36</sup> have come to the fore, where local government, health and third sector agencies work together to address food, health and exercise. These can involve whole school approaches to food and health and the promotion of healthier choices in leisure centres<sup>37</sup>. However, these findings appear to suggest that there is room for improvement, similar to experiences in other parts of the UK<sup>38</sup>.

Whilst the majority of participants claimed to drink sports drinks, it became apparent that there was some confusion over the definition of a sports versus an energy drink. However from a dental and wider health perspective these two drinks types have similar detrimental effects due to their high free sugar (unless sugar free) content and low pH.

In supermarkets and local shops, sports drinks are sold alongside other sugar sweetened beverages. This could indicate to children and parents that they are meant for use by everyone. Where these drinks are sold in shops should be re-assessed, so as to ensure people do not misunderstand the purpose of the product. The prices of these drinks also needs to be considered; the recent lobby by Public Health England<sup>39</sup> and others for a sugar tax on sugar sweetened beverages was successful in March 2016<sup>40</sup>.

The fact that sports drinks are so popular with children because of their sweet taste as opposed to reasons associated with sport (which are tenuous) should add weight to the case for an excise duty on sweetened beverages incorporating sports drinks.

## CONCLUSION

A high proportion of children consumed sports drinks regularly and outside of sporting activity. Dental health professionals should be aware of the popularity of sports drinks with children when giving health education advice or designing health promotion initiatives.

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Table 1 Location and participation by school and year group

School	Location	Number of respondents			
		Year 8		Year 9	
		Total number in class	Number taking part	Total number in class	Number taking part
A	Cardiff	20	0	13	12 (7M, 5F)
B	Rhondda Cynon Taf	30	30 (15M, 14F, 1 MV)	30	30 (15M, 15F)
C	Rhondda Cynon Taf	21	21 (21M)	18	18 (18M)
D	Rhondda Cynon Taf	25	25 (25F)	26	24 (24F)
Total number of respondents		96	76	87	84

\*M – male, F- female, MV – missing value

Figure 1 Reported frequency of sports drinks consumption, for the 143 respondents who reported drinking them

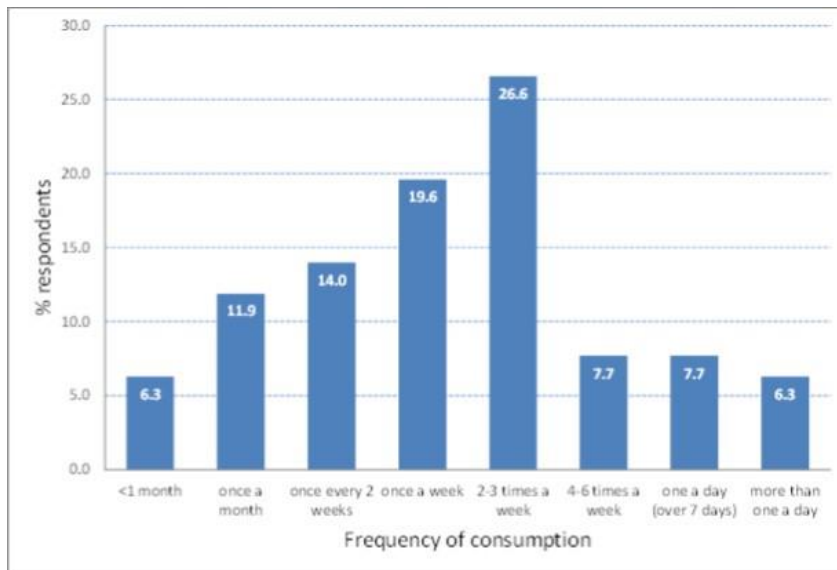


Figure 2 Drink type consumed, by the 143 respondents who reported drinking them (respondents could report drinking more than one type)

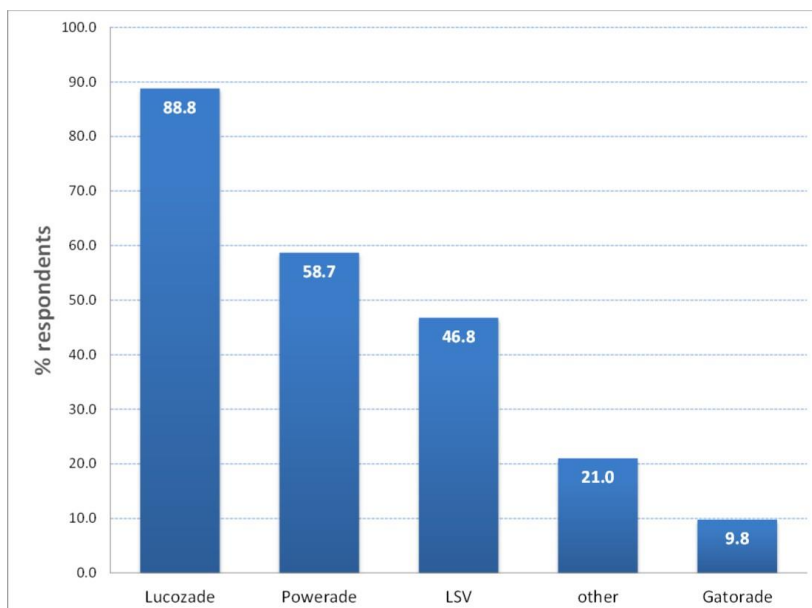


Figure 3 Location of purchase, identified by the 143 respondents who reported drinking sports drinks (respondents could report more than one location)

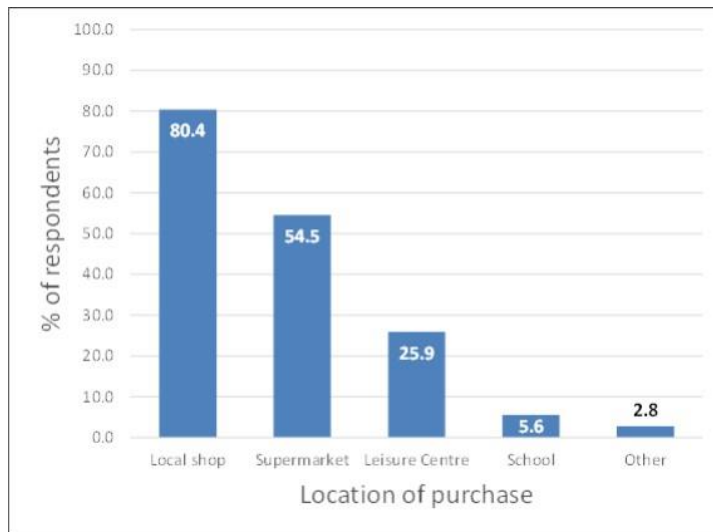
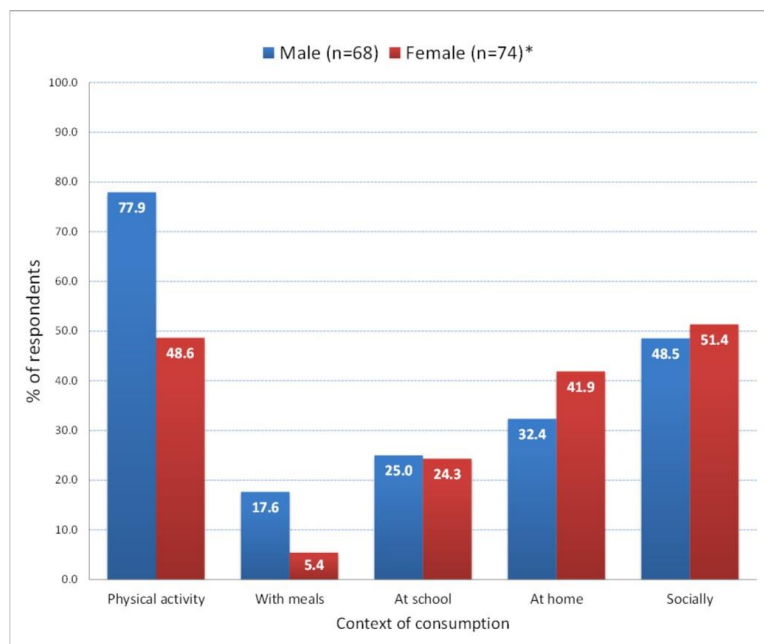


Figure 4 Context of consumption, identified by the 142\* respondents who reported drinking sports drinks (respondents could report drinking in more than one context).



\*1 missing value for gender

			S\$when_drink <sup>a</sup>					
			when_phy sicalactivi y	when_me altime	when_sch ool	when_ho me	when_soc ially	Total
gender	Male	Count	53	12	17	22	33	68
		% within gender	77.9%	17.6%	25.0%	32.4%	48.5%	
	Female	Count	36	4	18	31	38	74
		% within gender	48.6%	5.4%	24.3%	41.9%	51.4%	
Total		Count	89	16	35	53	71	140
Percentages and totals are based on respondents.								

Percentages and totals are based on respondents.

Figure 5 Reason for consumption, identified by the 143 respondents who reported drinking sports drinks (respondents could report more than one reason)

